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ABSTRACT

Many concepts, methods, and technologies regarding computer support in collaborative environments have been proposed. It is important to take into account human relations in collaborative learning environments, where personality plays a central role. However, it is not easy to build human relations in Web-based education (WBE), because there are some problems in computer-mediated communication. To overcome such problems, this paper proposes the concept of personality information for awareness (PIA), which represents information for self-awareness/analysis, self-disclosure, person awareness/analysis and person perception. The authors are designing a PIA-based system, called PIAGET (Personality Information for Awareness applied to Group learning in Web-based Education/Training Support system), which supports human relations building for collaborative learning in WBE. This paper focuses on sub-systems for self-awareness/analysis, consisting of functions, such as the YG test module and the Grouping Formation module. (Author)

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A Fundamental Study for Grouping Formation Module based on Personality Information

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Abstract: Many concepts, methods and technologies regarding computer supports in collaborative learning environments have been proposed. We believe that it is important to take into account human relations in collaborative learning environments, where personality plays a central role. However, it is not easy to build human relations in WBE, because there are some problems in computer mediated communication. To overcome such problems, we propose the concept of personality information for awareness (PIA, for short), which represent information for self-awareness/analysis, self-disclosure, person awareness/analysis and person perception. We are designing a PIA-based system, called "PIAGETS (Personality Information for Awareness applied to Group learning in web-based Education/ Training Support system)", which supports human relations building for collaborative learning in WBE. In this paper, we report with focus on sub-systems for self-awareness/analysis, consisting of functions such as YG test module and Grouping Formation module.

1. Introduction

In the brave new world of Web Based Education (WBE), many educational systems have been proposed. Collaborative learning in WBE can be as effective as in face-to-face classroom activity, but it is not easy to design. In web-based collaborative learning environment, awareness is important to create efficient collaboration.

We believe that it is important to take into account human relations in collaborative learning environments - either face-to-face or web-based - where personality plays a central role. However, our view concerning the current situation of most Universities in Japan is that it has become difficult that to build human relations in face-to-face classroom, because students are not motivated to collaborate with their classmates. On the other hand, for the case of web-based classes, it is not easy to build human relations due to problems related to computer-mediated communication (CMC) .Matsushita et al 1995..

To overcome such problems, we propose the concept of personality information for awareness (PIA, for short), which represent information for self-awareness/analysis, self-disclosure, person awareness/analysis and person perception. We are designing a PIA-based system, called "PIAGETS (Personality Information for Awareness

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applied to Group learning in web-based Education/ Training Support system)", which supported human relations building for collaborative learning in WBE.

In this paper, some fundamental studies for the design of PIAGETS are described. We first discuss the concepts of PIA and PIAGETS. Next, we report on the development of a sub-system called "YG test module" followed by sociometric investigation. Finally, we present an overview of the "Grouping Formation module" design.

2. PIAGETS for Human Relations Building

In this section, we first explain our motivation to focus on the human relations. Next, we propose the concept of PIA. Finally, the overview of our PIA-based system called "PIAGETS" is presented.

2.1. Attention to the human relations

The authors are in charge of an information system design class. By looking at the students, we note that their participation in the class is relatively poor. Their participation is more passive than active, like if they where watching TV, with no expression or reaction sometimes. The amount of discussion regarding lesson content with the classmate is poor. It seems like the human relations between learners is not deep enough.

We believe that such human relationships can be improved through discussions with classmates, thus the learning will be promoted. In our view, the functions necessary to support collaborative learning in WBE includes tools for cooperative work, support for knowledge awareness and understanding and functions for building human relationships.

In this paper, we focus on the function that supports the improvement of human relations.

2.2. Personality Information for Awareness (PIA)

According to [Ogata et al 1996], the collaboration process is lead from the following four processes: Co-presence, Awareness, Communication, Collaboration and Coordination. In collaborative learning environments, awareness is important to create efficient collaboration. We believe that it is important to take into account human relations in collaborative learning environments, where personality plays a central role. Thereupon, we propose the concept of PIA. Our hypothesis is that in order to build the human relationships, each learner pursues the communication activities shown in Figure 1.

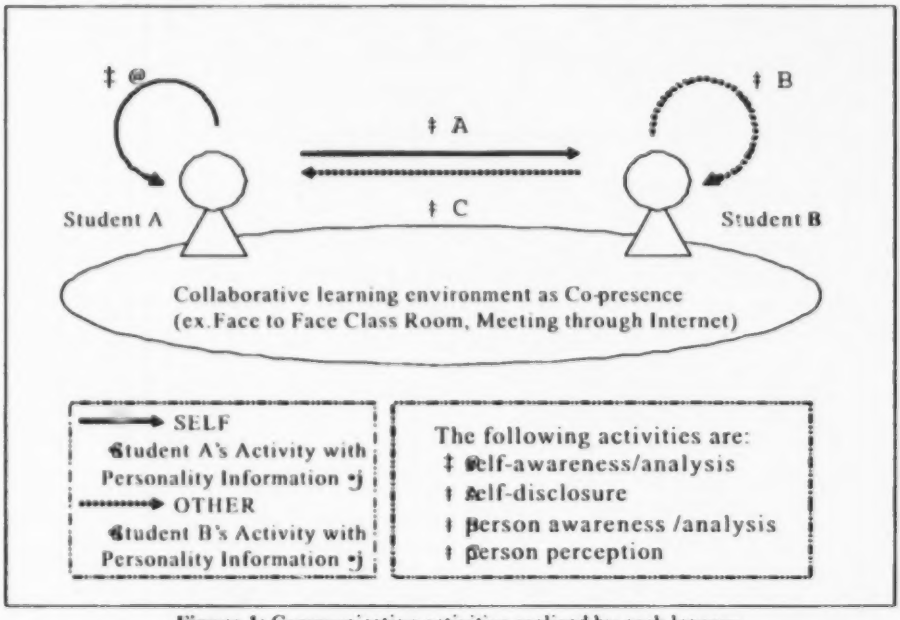

Figure 1: Communication activities realized by each learner

Although the Figure 1 shows the student A as the focus of attention, the same activities are valid for student B. The PIA represents information for:

- self-awareness/analysis: The process in which, the student A perform self-analysis in order to form the self-concept. By this, the student A discovers himself.
- self-disclosure: The process in which - from the results of self.awareness/analysis - the student A selects, some time decorates and shows to the public (student B in case of figure 1) only the selected/decorated information.
- person awareness/analysis: The process in which, the student B notice and analyze the personality information presented by others (student A in case of figure 1).
- person perception: The process in which – from the results of person awareness/analysis - the student B acknowledge whether or not to build interpersonal relationship with student A.

2.3. Overview of "PIAGETS"

We are designing a PIA based system, called "PIAGETS", which supported human relations building for collaborative learning in WBE.

PIAGETS is composed of the following functions, shown in Figure 2:

(1) Sub-systems for self-awareness/analysis,
(2) Sub-systems for self-disclosure
(3) Sub-systems for person awareness/analysis
(4) Sub-systems for person perception

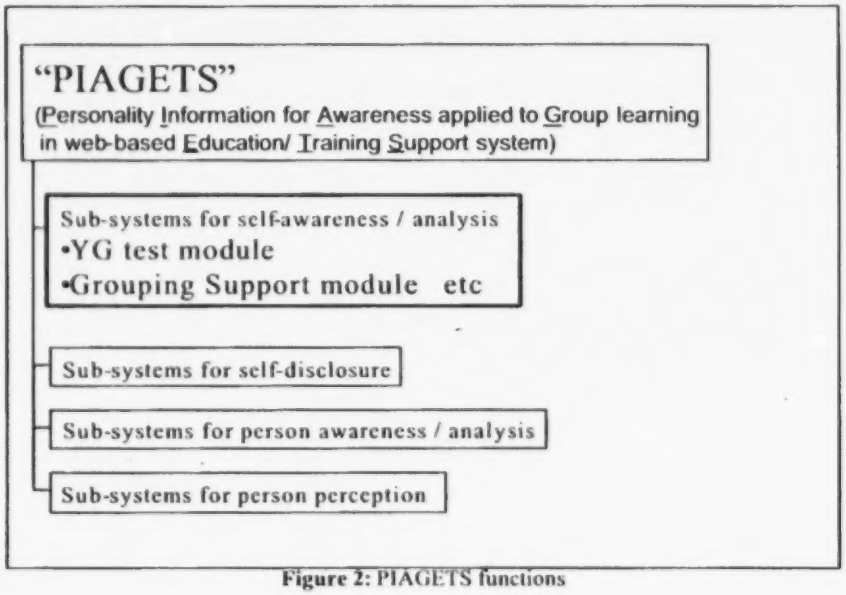
"PIAGETS"
(Personality Information for Awareness applied to Group learning in web-based Education/ Training Support system)
Sub-systems for self-awareness / analysis
•YG test module
•Grouping Support module etc
Sub-systems for self-disclosure
Sub-systems for person awareness / analysis
Sub-systems for person perception

Figure 2: PIAGETS functions

In this paper, we report with focus on (1) Sub-systems for self-awareness/analysis, consisting of functions such as YG test module and Grouping Formation module. We provide the details of YG test module and Grouping Formation module, in section 3 and section 4, respectively.

3. Basic investigation for face-to-face classes

We focus on face-to-face learning environments such as classrooms, where the learner is participating in the class by developing human relationships with the teacher and with the classmates. In order to make clear the structure of such human relationship from the personality viewpoint, we have conducted two investigations, described in the following subsections.

3.1. Development of YG personality test module, and personality test

In this research, we have focused on the YG personality test (Y for Yatabe, G for Guiford), which is a traditional method to examine the personality in Japan. First, in order to clarify the individual's character and their characteristics, the strength of 12 pre-defined personality trait are measured. Based on this measurement, the individuals are classified into 5 personality group types A, B, C, D or E. These 12 personality traits belong to one of 2 classes, where 6 belong to the "General emotionalism" class (D: Depression, C: Cyclic tendency, I: Inferiority, N: Nervousness, O: Objectivity, Co: Cooperativeness) and the remaining 6 to the "Extroversion/Introversion" class (Ag: Agreeableness/Aggressiveness, G: General activity, R: Rhythmic, T: Thinking extroversion, A: Ascendance, S: Social extroversion). Moreover, there are cases in which the individuals are judged to be of two or more of the A, B, C, D or E types, e.g. belonging to both type A and type C.

The original YG personality test has 120 questions. However, in order to reduce the time required to answer the questionnaire, we have used the trial YG personality test developed by Uehara, which consists of 36 questions.Uehara 1997.. In Uehara's trial test, the 5 personality types are named as follows: A as "average type", B as "black list type", C as "sedative type", D as "adaptive type" and E as "eccentric type".

We have developed a Web-based YG personality test, which we will refer as YG test module, for short. The module is based on CGI with Perl and a set of HTML Web pages. This YG test module can be used as a psychological testing to analyze self- personality objectively. (The output data is used in the Grouping Formation module.) An example of answer input screen and the result display screen for the YG test module are shown in figures 3 and 4, respectively. The user answers the questions given in the input screen by selecting one of the radio-buttons. When user finishes with the answers, the module calculates which of the personality group he belongs to and displays the results on the screen. A sample data of the personality that was obtained with the YG module is shown in Table 1.

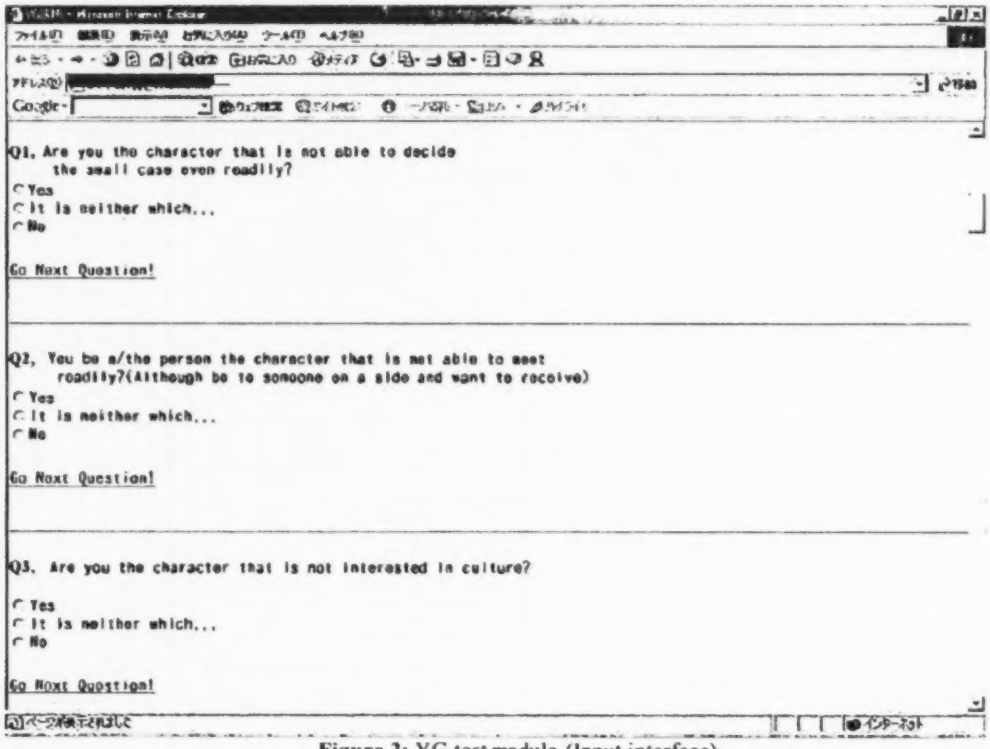
Q1, Are you the character that is not able to decide the small case even readily?
Yes
It is neither which...
No
Go Next Question!
Q2, You be a/the person the character that is not able to meet readily?(Although be to someone on a side and want to receive)
Yes
It is neither which...
No
Go Next Question!
Q3, Are you the character that is not interested in culture?
Yes
It is neither which...
No
Go Next Question!

Figure 3: YG test module (Input interface)

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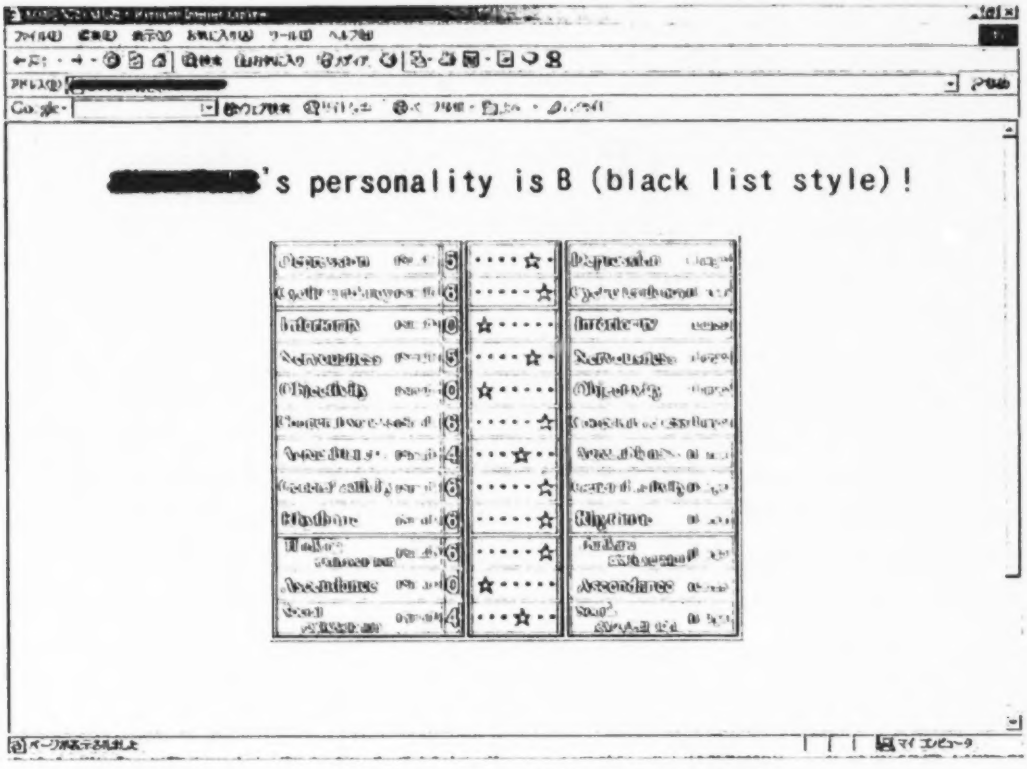

Figure 4: YG test module (Output interface)

Table 1: The personality type data by YG test module

Respondent• iStudent No.• j	D	C	I	N	O	Co	Ag	G	R	T	A	S	personality type (by YG)
Student .P	2	4	2	1	4	6	3	0	0	4	2	4	C
Student .Q	1	3	4	4	3	2	3	5	2	5	4	5	A
Student .R	4	4	5	4	4	2	2	4	0	5	1	6	A
Student .S	1	1	3	2	2	1	1	1	0	1	2	3	C
Student .T	1	6	5	4	2	1	2	3	2	2	3	3	C
Student .U	4	4	6	2	2	1	2	0	0	0	2	3	C
Student .V	2	4	2	2	3	2	4	1	1	3	6	4	C
Student .W	0	6	3	5	1	0	4	2	0	3	4	5	C
Student .X	0	6	3	2	2	2	4	1	2	0	4	5	C
Student .PO	2	2	4	1	4	2	5	2	1	5	6	5	D
Student .PP	2	4	2	2	2	2	3	2	5	6	5	6	D
Student .PQ	2	6	4	4	2	2	2	1	5	4	3	6	C and D
Student .PR	4	4	3	4	4	4	4	2	3	4	0	3	A
Student .PS	2	2	2	1	1	1	6	1	4	6	5	6	D
Student .PT	2	6	3	3	3	1	5	2	2	5	5	2	C and D
Student .PU	1	3	5	2	3	1	4	2	6	3	6	4	A and D
Student .PV	2	3	2	3	1	3	1	4	3	4	2	2	A and C
Student .PW	3	3	5	4	2	0	1	2	0	3	3	2	C
Student .PX	3	2	3	4	5	0	1	1	2	0	6	2	C
Student .QP	4	4	1	3	2	0	3	2	2	3	6	4	A
Student .QQ	1	3	3	3	4	2	3	0	0	2	4	4	A

• :There is not the reply data of student 20 that was absent to the lesson that did the YG test.

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3.2. Measuring the influence of student's "buddy" or "pal" on the personality structure

In order to measure the influence of the student's "buddy" on his personality structure, we have investigated using the YG test module the student's buddy concurrently with the execution of the YG personality test. Concretely - to clarify the student's buddy based on observations - we have observed several times the student's seat selection in the classroom.

First, based on the observations of the students in the classrooms, we have guessed the student's buddy as shown in Figure 5. For instance, the learners surrounded by lines in Fig. 5 were assumed to have some student's buddy. Then we have investigated the seating places in the classroom of the students, during 4 classes.

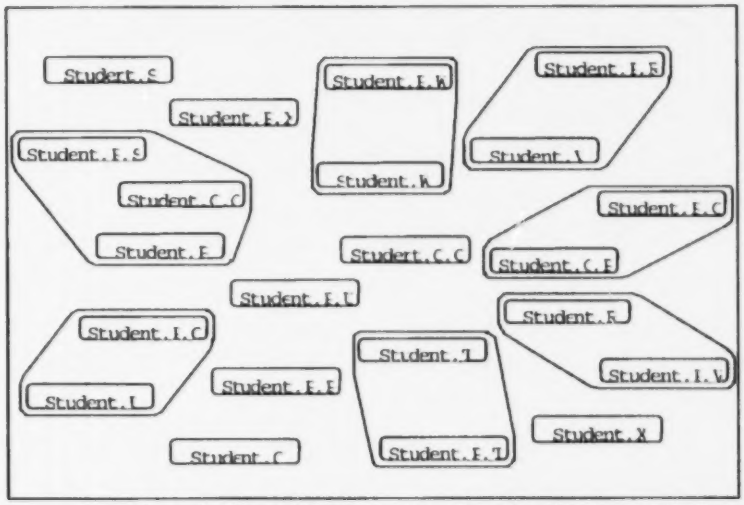

Figure 5: The student's associates (based on the observations)

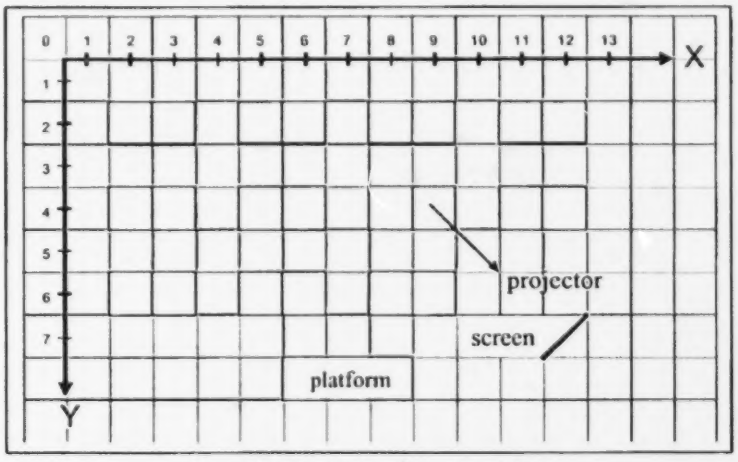

Figure 6: The students' seating position

The students' seating positions were plotted according to the axis shown in Figure 6, and the physical distance between students calculated using the formula 1. .Note : we have excluded from the study the students with more than 1 absence. From the position of the seats in the classroom, our assumption is that students with average physical distance of two or less (i.e. pair) show a student's buddy.

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Student ƒ ¿s seating position •Ж1• &1•j
Student ƒ À seating position •Ж2• &2•j

The physical distance between Student ƒ ¿and Student ƒ À

•@@√Ж2- X1 ȷ⁰- Ж2- Y1 ȷ⁰•@@formu la , P

Formula 1: the physical distance between students

Table 2 summarizes the result of the mean distance and the YG test module for each pair. From the results of the Table 2 and Figure 5, we found correspondence in all pair of students, which prove the correctness of our assumptions. Thus, we have confirmed that buddies tend to seat close to each other.

Table 2: Summarizes the result

Pair No. /physical distance	Respondent• iStudent No.• j	D	C	I	N	O	Co	Ag	G	R	T	A	S	personality type (by YG)
Pair . P	Student .R	4	4	5	4	4	2	2	4	0	5	1	6	A
1.25	Student .PV	2	3	2	3	1	3	1	4	3	4	2	2	A and C
Pair . O	Student .U	4	4	6	2	2	1	2	0	0	0	2	3	C
1.00	Student .PQ	2	6	4	4	2	2	2	1	5	4	3	6	C and D
Pair . R	Student .V	2	4	2	2	3	2	4	1	1	3	6	4	C
1.00	Student .PR	4	4	3	4	4	4	4	2	3	4	0	3	A
Pair . S	Student .PS	2	2	2	1	1	1	6	1	4	6	5	6	D
1.25	Student .OO	1	3	3	3	4	2	3	0	0	2	4	4	A

3.3. Student's buddy are build between learners with different personality types

Basically, the data of the YG test module is judged to belong to one of the five personality types A to E. However, taking into account the cases in which a data can belong several types simultaneously, there are 31 possible combinations types (calculated based on the combinatorial formula 2). We can see from the results shown in Table 2 that the pairs are composed of learners belonging to different personality types. For instance, regarding the pair 2, the result of the YG test module shows that learner 12 is both C type and D type, while learner 6 is only type C. Thus, we can say from the results of the 4 pairs that in face-to-face classrooms, student's associates are build between learners with different personality types.

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• @: RPossible Combinations types.

Formula 2: calculated based on the combinatorial formula

4. Grouping Formation Module based on Personality Information

We have developed a Web-based Grouping Formation module, based on CGI with Perl and a set of HTML Web pages. The Grouping Formation module uses the judgment result data from the YG test module. Based on the results of the judgment result data, the system propose the learner's grouping (pair) so that each group is composed from members with different personality types.

The group-formation process (pair) is done with 7-steps algorithm explained bellow:

Step 1: the learner's name is stored in the arrays, one array for each of the 31 type combinations.

Step 2: For each of the 31 arrays, the learners are re-ordered randomly.

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Step 3: The number of learners is counted at each array, and the 31 arrays are ordered in descendent order, based on the total number of learners for each type, i.e. the array type with most learners first.

Step 4: In order to form the pairs, one learner is picked up sequentially, from the array with most learners and the second with most learners. Output the resulting pair.

Step 5: For step 4, if there are no more learners left on the array to form the pairs, then the next array with most number of learners is selected.

Step 6: Repeat the step 4 (and step 5 when necessary), to continue the pair formation process.

Step 7: When there is no two arrays of different types, then form the pairs randomly with learners from the same array.

5. Conclusion and Future Works

In this paper, we first discuss the concept of personality information for awareness, and a PIA-based system, called "PIAGETS", which supports human relations building for collaborative learning in WBE. Next, we report on the development of a sub-system called "YG test module" followed by sociometric investigation. Finally, we present an overview of the "Grouping Formation module" design.

Based on the data gathered from the YG test module, we worked to find out the influence of the student's buddy on the personality structure. We can see from the results that the pairs are composed of learners belonging to different personality types.

Future works include the evaluation of the effectiveness for our proposed PIAGETS, the investigation of the human relationship building process and the implementation of additional support functions for human relationship building.

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